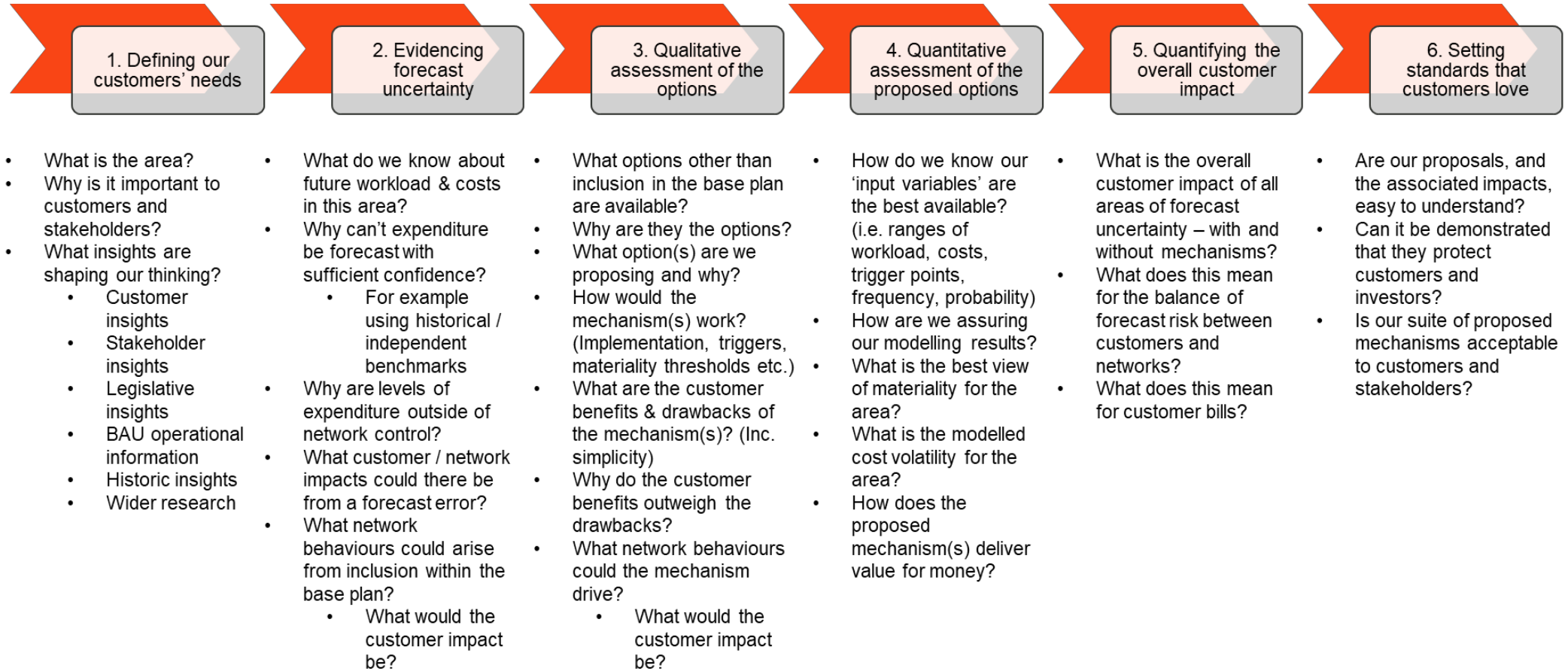


# Appendix 10.11

## Uncertainty Mechanism Case

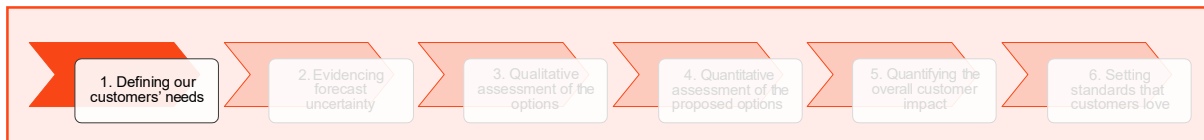
### Connections

## Cadent's systematic approach to developing uncertainty mechanisms to manage forecast uncertainty



Uncertainty area			
Demand uncertainty	Legislative uncertainty	Cost confidence	Heat Policy
<p><b>Connections</b></p> <p><b>Cadent proposal</b></p> <p><b>Volume Driver Uncertainty Mechanisms</b></p> <p>Under Section 9 of the Gas Act, we are obligated to connect customers to the gas network where it is efficient to do so. New connections are triggered by a third-party request. While there is a trend between new housing and new connections, the timing and predictability of housing forecasts are less certain, with delays in planning applications and dependencies on investments from developers.</p> <p>Observed trends in industrial connections are even more volatile and tend to be influenced by political triggers and movements in the economy. This includes uncertainty with future Government decisions on the role of gas, and their implications for connections. Given the difficulty in forecasting and the different views on future economic or housing growth, there is uncertainty in the volume of new connections required in RIIO-2.</p>			

## 1. Defining the need



### 1.1. What is the area?

New connections are triggered by customer demand, which creates a challenge in forecasting the future volumes we may be required to provide. Our strategy in RIIO-2 will remain consistent with our existing approach: to react to customer demand rather than proactively looking to increase market share. Our operational focus will be to raise our standards of customer service to deliver consistently high levels of service whilst increasing the efficiency of our delivery.

We are required to undertake new connections both for domestic and for industrial customers: however, the charging arrangements differ between the groups.

The Gas Licence Condition 4B outlines that for domestic customers who require a gas connection within 23m of a relevant main, the costs incurred in delivering the work for the first 10 metres on public land is paid for by general consumers through transportation charges. Ofgem provides this funding to Cadent through a regulatory allowance called the 'domestic load connection allowance'.

For industrial connections, Cadent must connect customers to the gas network where it is efficient to do so. There is no regulatory allowance for this work, with customers paying for the whole connection cost. This market is more competitive than the domestic market, and Cadent tends to pick up work as 'a supplier of last resort' (i.e. work that the rest of the market does not want).

## 1.2. Why is it important?

Under Section 9 of the Gas Act, Cadent is obligated to connect customers to the gas network where it is efficient to do so. There are further regulatory standards we are required to meet for connections:

- General Standards of Service – providing customers with quotes, planned dates and completing aspects of the job by set timescales.
- Customer satisfaction measures (only applicable to domestic connections) – providing customers with a service that meets an acceptable standard as set by Ofgem (the ‘CSAT measure’) and is measured through customer surveys.

## 1.3. What insights are shaping our thinking?

We have analysed our existing volumes of new connections to consider the future trend for RIIO-2. However, forecasting connection volumes is fundamentally difficult (as outlined in Section 2.2). This is demonstrated by our actual connection volumes in RIIO-1 to date for domestic connections compared to our RIIO-1 submission. Our actual volumes are approximately 10% lower.

As part of our planning process, we have undertaken work to understand the potential range of future growth across our networks. This included a study of new housing growth anticipated during RIIO-2, considering known announcements made across our network at present. We conducted a study across 60/370 of our local networks to understand reinforcement and replex requirements as a result of this growth. Table 1 below summarises the estimated growth, equivalent to approximately 5% on average over RIIO-2 at the Cadent level.

**Table 1: Estimated new housing growth (based on a study of 60/370 networks)**

New housing growth	East of England		London	North West	West Midlands
	EA	EM			
Average housing demand growth by end of RIIO-2	4.85%	4.11%	4.07%	5.69%	5.26%

In contrast to this study, recent policy discussion has focused on the potential of a gas boiler ban in new homes from 2025. This creates considerable uncertainty on the future volume of new connections that we may be required to undertake in RIIO-2, especially given the challenges in understanding how new housing growth may translate to demand for new connections if such a ban came into force.

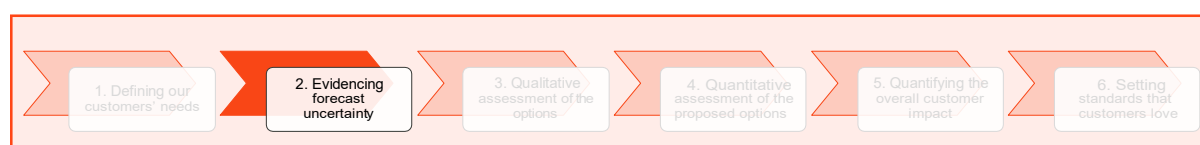
Alongside undertaking studies to understand the demand for new connections, we have engaged with customers to understand the importance of the new connections process to them. Insight from our business as usual operations provides a view of how well our connections process works. 72% of customers of the connections process who completed CSAT surveys gave scores of 8-10, although this falls to 64% in London. The highest scoring questions for this process are: (1) skill and professionalism of the workforce, (2) time to provide a quote, (3) overall quality of work. However, the lowest scoring questions were (1) time to schedule work, (2) reinstatement and excavations and (3) overall communication during work.

'Rant and Rave' SMS survey results also give an indication of how satisfied customers are with connections to the gas grid:

- Application stage: 95% satisfied, approximately the same across regions
- Planning stage: 98% satisfied, approximately the same across regions
- Completion stage: 91% satisfied, falling to 88% in London

From social media posts relating to connections, 25% were general queries or asking for advice, 14% commenting on the application process, and 12% related to getting things right first time. Connections or alterations to supply were the most common reason people called the Citizens Advice's consumer helpline, accounting for 58% of calls across all energy networks, and 43% of calls relating specifically to Cadent.

## 2. Evidencing the uncertainty



### 2.1. What we know about the future

We understand that new connections are driven by customer demand. A range of external factors, including the rate of new housing development, economic conditions, and Government policy towards the future use of gas heating will all have implications for the level of new connections that materialise in RIIO-2. Compared to RIIO-1, these factors create greater difficulty in developing our understanding.

#### Comparing uncertainty to costs included in our base plan

During RIIO-1, we received a fixed baseline allowance for costs associated with new connections. However, we have recognised the increased difficulty in forecasting future connection volumes, and therefore proposed an alternative approach for RIIO-2.

Our base plan includes expenditure on an annual basis based on the lowest volumes of new connections observed in RIIO-1 for each of our networks. These specific volumes are outlined in Section 4 and are associated with a total cost in our base plan of £86.21m as outlined below:

**Table 2: Baseline costs associated with new connections**

Base costs £m, 18/19 prices	2021/22	2022/23	2023/24	2024/25	2025/26
New connections (new housing, existing housing and non-domestic).	£17.31	£17.27	£17.24	£17.21	£17.18

Our proposal for an uncertainty mechanism provided funding for additional volumes above and beyond those included in our base plan. As will be discussed further in this document, the mechanism is based on the same unit costs used to develop our base plan proposals. In Section 3, we provide a full valuation of how the mechanism would work in practice alongside a baseline allowance.

## 2.2. Why we face forecasting difficulties

While the drivers of new connection growth are understood, there is considerable uncertainty about the timing and direction of trends in the volume of work required in RIIO-2.

In the case of domestic connections, while there is a trend between new housing development and new connections, the timing and predictability of housing forecasts are less certain, with delays in planning applications influencing our workload. We also rely on developers fulfilling proposed investments to deliver future volumes.

In the case of industrial connections, we face greater challenges in forecasting volumes which have historically displayed greater volatility than domestic. These connections are more likely to relate to the business cycle, alongside specific political triggers that enable infrastructure investment.

Looking forward to RIIO-2, we face greater challenges than in previous periods when forecasting new connection volumes, given the uncertainty over a future Government decision on heat policy, and changing customer behaviour (including the uptake of alternative heating and cooking provisions).

**We are unable to fully control the volume of new connections** we will undertake, as the work is customer led and our licence obliges us to provide a service in specific circumstances as outlined in Section 1.2. However, we will continue to engage with developers before and during RIIO-2 to understand their requirements and planned activity. This will allow us to develop a **better view** of the likely volumes of new connections that will be required in period. We will also have the opportunity to revise our forecasts in response to any future heat policy decisions made by Government that may have implications for new connection volumes.

## 2.3. Network impacts and behaviours from including in the base plan

**The risk with including all potential volumes and costs for new connections in our base plan** is that we would be required to rely on an uncertain estimate of future customer demand. This creates a risk that our estimate either under- or over-predicts the volume of work we will need to undertake, in an area where we have licence obligations to deliver work in specific circumstances.

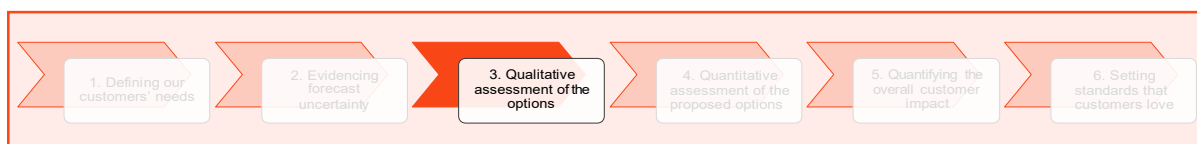
**If we were to include all costs associated with new connections in the base plan** as part of our RIIO-2 submission, we would be required to rely on an uncertain estimate of future growth rates, which is inherently hard to predict. Predictability is further reduced by the uncertainty around future heat policy decisions from the Government, which may have implications for the role of gas in new housing.

There is a credible **risk to Cadent** that our estimate could underpredict future volumes, creating a financial risk given our requirement to undertake new connections that are economically viable. We would face an incentive to price risk into the base plan estimate for new connections, to ensure we were adequately funded in a high-growth scenario.

However, this **creates a risk to customers**. There is potential that low volumes of new connections materialise in RIIO-2, which could be compounded by a Government heat policy decision that does not support the role of gas in new housing. This creates the opportunity for windfall gains.

Removing a component of this expenditure, beyond the minimum volumes of new connections observed on an annual basis in RIIO-1, ensures that customers only pay for the volumes of work that we deliver. This also helps to protect our licence condition to undertake economically viable connections without exposing Cadent to additional financial risk.

### 3. Qualitative assessment



#### 3.1. Options for addressing uncertainty

Given the uncertainty on the volume of new connections that may be required during RIIO-2, we have identified and evaluated other mechanisms that could be used to address this risk:

**Table 3: Evaluating options for uncertainty mechanisms**

Mechanism Option	Description
<b>Volume driver</b>	A volume driver makes use of existing information we have on the unit costs of new connections. This would effectively address the uncertainty identified in future growth and ensures we have access to funding that allows us to meet our licence conditions.
<b>Reopener mechanism</b>	A reopener accounts for uncertainty in costs when both the design and requirement for projects in RIIO-2 is unknown. Connections are not well suited to this, given existing information available on unit costs, and that uncertainty is driven by underlying volumes.  There is a risk that a reopener would create friction. We have a requirement to address economically viable requests for new connections: however, the additional checks and balances associated with revenue recovery could result in delays. This could impact our desire to provide timely connections to customers.
<b>Use it or lose it allowance (PCD)</b>	This would involve stating a price control deliverable (PCD) as part of our RIIO-2 plan. Whilst this would protect customers from under delivery, a PCD does not address the challenge we face in forecasting a total cost at present given the unknown volume of work. There a risk that a PCD may be introduced which does not adequately fund the levels of new connections that may materialise in RIIO-2.

We have also undertaken a qualitative assessment of uncertainty in this area to further understand the need for an uncertainty mechanism for connections.

**Table 4: Qualitative assessment of risks posed by connections**

Volume risk	Unit cost risk	Impact on outputs	Material cost / bill impact
High	Low	Medium	High

Further detail on our assessment is provided below:

- **Volume risk:** Our work is driven by external customer demand, to which we react. We have licence conditions which require us to undertake connections that are identified as economically viable. Therefore, we are unable to effectively control the number of connections we must undertake.
- **Unit cost risk:** There is uncertainty over cost forecasts at present, given the volatility in connection volumes. This is driven by uncertainty in underlying volumes, rather than unit costs. Further, this is partially mitigated by our base plan investment to provide for a minimum level of new connections as shown in Section 2.1.
- **Impact on outputs:** This area has implications for customers requiring new connections, including outputs relating to the level of customer service we provide.
- **Material cost / bill impact:** The potential volume uncertainty identified for connections may drive significant costs in RIIO-2. There is also uncertainty on timings with these costs, as project are driven by customer demand.

### 3.2. Our proposed uncertainty mechanism

We are proposing to address uncertainty related to connections with a **volume driver** in RIIO-2, using a unit cost approach to reflect the cost of undertaking different types of connections. In practice, this mechanism would involve agreement on the relevant unit rate to apply to specific volumes of new connections with Ofgem.

#### Operation of the proposed volume driver in practice

- **Form of the trigger:** As discussed in Section 1.1, new connections are triggered by customers. In the case of domestic connections, we have licence obligations to undertake requests that meet economic efficiency tests. For industrial connections, we must also comply with requests that can be economically delivered, although competition exists in this market.
- **Mitigating the likelihood of the trigger:** We are required to respond to customer demand; it would not be appropriate for us to mitigate the likelihood of new connections being demanded.
- **Claiming costs through the volume driver:** We would, on an annual basis, submit data on the actual volumes of new connections that we have undertaken as part of the RRP process. Revenues would be recovered with a year lag, in line with agreed unit rates, allowing time to verify our submitted volumes.

#### Form of the volume driver:

- **Unit of volume:** We propose volumes are measured in relation to the number of services delivered and length of associated mains by diameter (in km). This is in line with information already reported on an annual basis through the RRP process, and reflects the different workloads associated with delivering new connections.
- **Establishing unit costs:** As discussed further in Section 4.0, we have proposed that the unit costs within this volume driver align to the unit costs for delivering services and mains used to develop our base plan. These costs have been developed through analysing our performance to date, and our future views of efficiency for new connections.



### 3.3. Evaluating our proposed uncertainty mechanism

A volume driver allows us to protect against the risk of submitting a full base plan allowance that may be calibrated on an incorrect forecast of future growth. It would also make use of agreed unit cost rates to ensure customers only pay for work that is undertaken.

Nevertheless, it is important to fully evaluate the behaviours that our proposed uncertainty mechanism will encourage, to ensure they do not create perverse incentives. Below, we consider positive behaviours that a mechanism should promote.

**Table 5: Evaluating incentives created by our proposed uncertainty mechanism**

Behaviours and incentives	Evaluation
<b>To minimise costs</b>	<p>The costs we have proposed as part of our baseline allowance for connections represent our view of achievable and efficient costs in RIIO-2. We have developed our proposed volume driver in line with these costs.</p>
<b>To deliver required work</b>	<p>A financial incentive remains under the volume driver to identify further efficiencies and to deliver new connections below these unit costs where possible. This would also benefit customers, through the achievement of a lower unit cost in the future and sharing through the totex incentive mechanism.</p> <p>Since new connections are triggered by external demand, and we must respond to these requests when it is economical to do so, a volume driver would not create an incentive to avoid undertaking connections work. This would have wider implications in terms of our performance under CSAT and our proposals within our business plan to improve the customer experience around connections.</p> <p>It also would not be possible for us to undertake new connections beyond the economically efficient level, given that such work is triggered by a connections agreement that requires the participation of a third party.</p>
<b>To take a whole systems approach</b>	<p>There may be a concern that a volume driver for new connections limits our incentive to consider wider strategic solutions or to take a whole-systems approach to new customer demand.</p> <p>In the case of new connections, we remain incentivised to deliver any future connections in the most efficient way given financial incentives that are created to identify savings against an agreed unit rate. This would include identifying better solutions where appropriate.</p>

Behaviours and incentives	Evaluation
<p><b>Interactions with expenditure included in our base plan</b></p>	<p>The costs and volumes included in our base plan are developed across identical categories of connections (objectively determined, in line with RRP requirements), and using the same unit costs associated with our volume driver.</p> <p>Our proposal is for costs incurred to be allocated initially to our baseline allowance. Any further connections beyond this value would trigger the application of the volume driver. It would not be possible for us to gain from whether a specific connection is determined as baseline or volume driver activity, as identical unit costs would apply in each scenario.</p>

A potential drawback for customers is that bills may be exposed to any volatility in new connections on an annual basis, with revenues recovered with a yearly lag. However, this risk is mitigated by the inclusion of a minimum level of investment in our base plan, creating an element of stability within the overall bill impact of new connections.

### Interactions with other uncertainty mechanisms in our proposed package

Our proposals for a connections volume driver will interact with the Ofgem-prescribed reopener for heat policy in practice. As described in Section 2.1, a key driver of the uncertainty in future connections volumes is the direction of future Government policy towards the use of gas in new housing.

Recognising our dependence on any significant Government policy decisions taken during RIIO-2, our proposed approach ensures we can adapt and respond accordingly. For example, if a decision was taken that prevented new gas connections during RIIO-2, we would not recover any costs through the volume driver mechanism. By including a conservative estimate of new connections in our base plan, customers exposure to this is limited.

Furthermore, the heat policy reopener would provide the opportunity for a specific adjustment by Ofgem to our baseline allowances for connections if required following any relevant decisions by Government.

## 4. Quantitative assessment



### 4.1. Inputs for uncertainty modelling

We have considered potential scenarios for the future growth in new connection volumes in our uncertainty analysis. We have considered the following factors:

- **Unit costs** – the individual rates that apply to specific connection volumes
- **Volumes** - we have considered potential scenarios for increases in volumes relative to the assumptions already include in our base plan.

Table 6 below summarises the volumes of new connections already included in our base plan investment assumptions. These volumes correspond to the lowest amount observed during the RIIO-2 period on an annual basis. They have been excluded from our subsequent uncertainty analysis, such that our results illustrate the potential cost risk **beyond** our base plan investment.

**Table 6: Input assumption– annual connection volumes included in our base plan**

Annual volume (Services – number of) (Mains – length of pipe km)	East of England	London	North West	West Midlands
New Housing – Services	2005	705	621	719
New Housing – mains <180mm	2.63	0.89	0.55	1.04
Existing Housing – Services	3712	1329	1554	1396
Existing Housing – Mains <180mm	1.40	0.36	0.33	0.18
Non-domestic – Services	135	107	75	71
Non-domestic – Mains <180mm	0.11	0.11	0.04	0.27

## Volumes

We have developed a ‘likely’ and a ‘high’ scenario, beyond the investment included in our base plan, to illustrate the potential impact of different growth scenarios on our volumes of new connections. In our high case, we have assumed volumes growth on average at a rate of 2% per annum from existing volumes observed in 2018/19. In a likely case we have assumed an equivalent rate of 1% applies, as summarised below. We have applied these assumptions to our latest RRP figures, and then removed the volumes included in our base plan to focus our analysis on additional new connections only.

**Table 7: Input assumption– growth scenarios in connections per annum**

Cadent annual volumes growth for connections (%)	Low	Likely	High
Annual growth rate	0%	1%	2%

## Unit Costs

We have aligned our assumptions for new connections within our proposed volume driver with those used to develop our base investment plan. In Table 8 below the average net unit cost for each network is reported across each connection’s workload. Individual unit rates for each year of RIIO-2 are provided in Appendix 09.27 Connections.

As outlined in Section 1, customers are only required to pay for specific elements of new connections. Therefore, we have accounted for customer contributions where applicable and focused our uncertainty analysis on net costs. Unit costs are provided for a service, and per kilometre of pipe laid for mains.

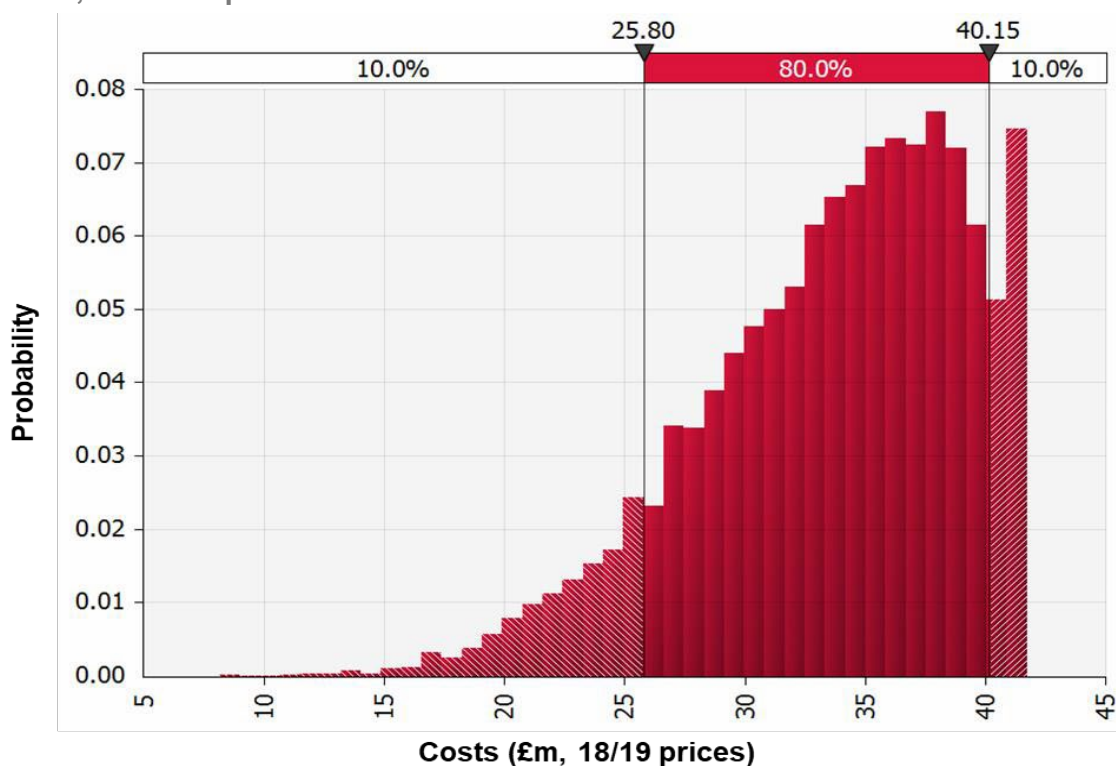
**Table 8: Input assumption– net unit costs for connections (£, 18/19 prices)**

Unit costs per connection	East of England	London	North West	West Midlands
New Housing – Services				
New Housing – mains <180mm				
Existing Housing – Services	Redacted due to commercial sensitivity			
Existing Housing – Mains <180mm				
Non-domestic – Services				
Non-domestic – Mains <180mm				

## 4.2. Assessing uncertainty

Using our input data described above, we have undertaken Monte Carlo analysis to understand the range of cost impacts for this area of uncertainty in RIIO-2. This provides a distribution of the potential cost outcomes for connections, based on 10,000 iterations. This approach illustrates the high and low scenarios of uncertain costs, alongside the mean cost outcome and the associated volatility. Figure 1 below summarises this distribution while Table 9 provides a breakdown of this risk by network.

**Figure 1: Monte Carlo: Total RIIO-2 Cadent cost risk for connections, no mechanism. Costs, £m 18/19 prices**



Minimum	Maximum	Mean	Standard Dev	Iterations
£8.14m	£41.73m	£33.60m	£5.51m	10,000

The results of our Monte Carlo analysis demonstrate the scale of uncertainty in connection volumes beyond those accounted for in our base plan. Without the introduction of an uncertainty mechanism, there is a considerable risk that actual costs incurred in RIIO-2 may deviate from an initial estimate proposed as a baseline allowance. This risk is particularly concentrated in our East of England network.

**Table 9: Monte Carlo: Total RIIO-2 cost risk by network for connections, no mechanism. Costs, £m 18/19 prices**

Network	Minimum	Maximum	Mean	Standard Dev
East of England	£0.18m	£17.28m	£13.74	£4.09m
North London	£0.07m	£12.52m	£9.96m	£2.96m
North West	£0.06m	£7.82m	£6.22m	£1.85m
West Midlands	£0.05m	£4.62m	£3.68m	£1.09m

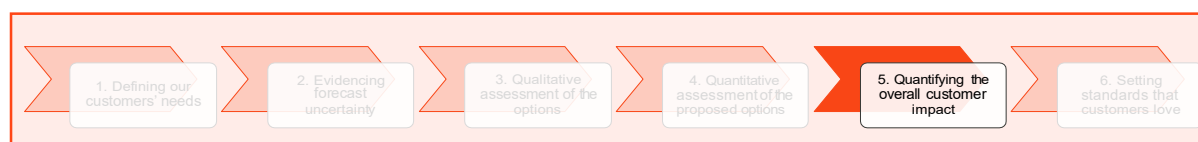
### 4.3. Impact of our proposed uncertainty mechanism

As we have assumed that income from volume drivers is not subject to a sharing factor, and given that a materiality threshold is not applicable, our modelling implies from a theoretical perspective that the uncertain cost risk outlined above would be fully mitigated using our proposed mechanism.

This **does not imply** that the costs associated with the uncertain volumes are fully mitigated and removed. Instead, the volume driver effectively allows us to collect associated revenues for connection volumes above the amount included in our base plan. This removes a cost risk – that is there are no remaining costs that we are exposed to that cannot be recovered.

In practice, we will remain exposed to residual risk based on how outturn unit costs compare to the rate agreed as part of the mechanism. This places an incentive on us to maintain a focus on cost efficiency when delivering new connections. Customers are also protected as costs are only recoverable for the actual volumes of work we undertake. Given the driver of new connections is customer demand, and we have licence conditions to respond when economically viable, this is out of our control.

## 5. Quantifying the customer impact



In Section 5 of Appendix 10.00 (Our approach to managing risk and uncertainty) we have analysed the overall customer impact of uncertain costs with and without our proposed package of mechanisms. We have also evaluated how our proposed package recognises the trade-off between sharing exposure of cost risk between Cadent and our customers. In Chapters 10 and 11 of our Business Plan, we also quantify the impact of our proposed package of uncertainty mechanisms on customer bills in RIIO-2.

We have also quantified the bill impact associated with the connections volume driver individually. Table 10 below summarises the potential bill impact per annum by the end of

RIIO-2 for the mean, P10 and P90 costs estimated in our Monte Carlo analysis. As the costs associated with this uncertainty mechanism are categorised as capex, the bill impact is spread over a significantly longer period for the mean cost impact below, this is equivalent to £0.08 per annum at the Cadent level.

**Table 10: RIIO-2 end bill impact, P10 mean and P90 costs from uncertainty analysis**

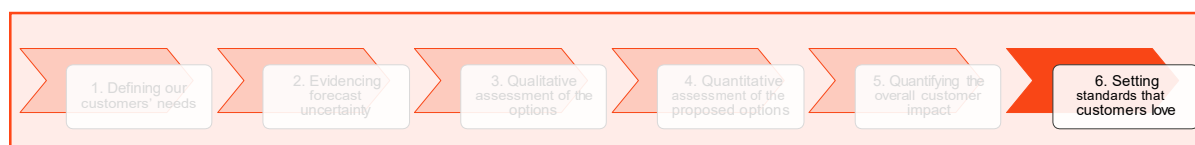
RIIO-2 end bill impact (£, 18/19 prices)	P10	Mean	P90
<b>East of England</b>	£0.11	£0.14	£0.17
<b>London</b>	£0.14	£0.18	£0.22
<b>North West</b>	£0.07	£0.10	£0.12
<b>West Midlands</b>	£0.06	£0.08	£0.09

For the purpose of constructing bill-impact estimates, we have focused on the central costs from our Monte Carlo analysis and have not considered the potential timing effects on revenue recovery from the use of a volume. In practice, bill impacts would materialise with a lag following a successful claim through the mechanism.

As outlined in Chapter 10 (Managing risk and uncertainty), Ofgem’s business plan guidance suggests that “uncertainty mechanisms that highlight risks to consumers of which Ofgem would not otherwise have been aware” is an example that could constitute part of a Consumer Value Proposition (CVP). We discuss our CVP in Section 7.1 of Chapter 7.

The value of a bespoke uncertainty mechanism to customers does not obviously lend itself to be monetised in the same way of some of our outputs commitments where we have calculated a social return on investment or have clear willingness to pay data. One way the value could be calculated is to look at the value that might otherwise have needed to be forecast into the base expenditure plan that may not have been subsequently needed if the uncertainty did not arise. For example, you could take our likely cost estimate, and multiply this by the totex incentive sharing factor that the customer would be faced with (e.g., 60%). This is not as robust a method as SROI or willingness to pay but provides an indicative estimate. In the case of connections, this is equivalent to approximately **£20.16m in RIIO-2**.

## 6. Setting the standards



Our proposals for a volume driver are clear and simple for our customers to understand. We will only be able to recover revenue for connections beyond the minimum level anticipated in RIIO-2, which are accounted for in our base plan. Our proposed unit cost rate must be agreed by Ofgem as part of this mechanism to ensure we deliver connections efficiently. We are also unable to control the volumes of connections that will be required in the future, as we respond to customer demand. This protects customers and avoids the creation of an incentive to maximise volumes beyond an efficient level. These proposals have incorporated challenges we have received from our CEG.

Our evaluation on the implications of including costs for connections in our base plan, as outlined in Section 2.3, and of the incentives associated with our proposed volume driver mechanism demonstrate the benefits of this approach for customers and stakeholders.

Our overall approach to managing risk and uncertainty using uncertainty mechanisms has been tested with customers through our acceptability testing. A full discussion of this engagement is provided in Chapter 10 – it is noted here that customers found this approach to be acceptable, and that we had been thorough in our work to manage cost risk in RIIO-2.